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"Advancing and Integrating Construction Education, Research and Practice"

August 4-5, 2008, Karachi, Pakistan

Abstract Book

Editors

Sarosh H. Lodi

Syed M. Ahmed

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Muhammad Saqib

Proceedings of the

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Proceedings of First International Conference on Construction in Developing Countries
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Edited By: Sarosh H. Lodi
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Preface

This volume comprises the abstracts of contributed papers presented at the First International Conference on Construction in Developing Countries, ICCIDC-I 2008 held on August 4-5 2008, in Karachi, Pakistan.

ICCIDC-I 2008 is jointly organized by Department of Civil Engineering, NED University of Engineering & Technology, Karachi, Pakistan and Department of Construction Management, Florida International University, Miami, Florida, USA. This international conference is arranged as part of a USAID funded research project entitled "Developing a Strategic Model for Improvement of Construction Project Management Education, Research, and Practice in Pakistan" aimed at developing strategic model for improving the construction industry of Pakistan.

The impact of infrastructure development and construction practices is known to be significant on the economy of any country. These practices improve the construction project management of any country. Therefore, this international conference is aspired to promote construction management practices and create awareness among different industry professionals. The main aim of this conference is to bring together renowned and qualified contractors, clients, academics and other professionals from all over the world, for the presentation and exchange of their thoughts and experiences on concepts, trends and practices of present-day construction management scenarios.

The conference is aimed at providing a platform for real life case studies contribution and assessment and evaluation of the current construction engineering, technology, management, research and education status of the industry in the view of the participants. The conference is intended to offer a stimulating environment to encourage discussion and exchange of ideas leading to endorsement of construction engineering, technology and management in developing countries.

This is a peer reviewed conference and all the papers included in the conference proceedings have been selected after an intensive review process performed by the international technical committee.

I would like to extend my appreciation to the Steering Committee, Advisory Committee, and the International Scientific Committee for the devotion of their precious time, advice and hard work to prepare for this Conference. Special thanks are due to United States Agency for International Development (USAID), Higher Education Commission Pakistan (HEC), and National Academy of Sciences (NAS), who have provided us immense support in organizing the conference. Appreciation is also due to our local sponsors including M/s ER Solutions, M/s Amreli Steels (Pvt.) Ltd., M/s Principal Builders, and National Foundation for Resource Development (NFRD). Last but not the least I would like to acknowledge and give special appreciation to our keynote speakers for their valuable contribution, our delegates for being with us and sharing their experiences, and our invitees for participating in ICCIDC-I 2008, Karachi, Pakistan.

Prof. Sarosh H. Lodi

Conference Chair

TABLE OF CONTENTS

BUILDING CONSTRUCTION TECHNICIANS TRAINING: IT'S RELEVANCE TO THE MODERN CONSTRUCTION INDUSTRY IN KENYA

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ABSTRACT

Training of Building construction technicians in Kenya is targeted at offering the construction industry a competent workforce that is able to perform the various tasks bestowed upon it within the construction industry. This paper discusses the training acquired by these technicians from Technical Vocational Educational Training (TVET) Institutions vis-à-vis the requirements of the construction industry. Areas considered are the technicians' performance at work; what they learn and what is required of them; and the teaching and learning materials used to train them. Data was collected through questionnaires, interviews and direct observation at construction sites. Respondents were construction site supervisors, technicians who had undergone the training, and lecturers in TVET institutions. The statistical tools used for data analysis were chi-square and the Analysis of Variance (ANOVA). Arguably, the findings reveal that the requirements of the construction industry is not in phase with the technicians performance at work, more is required of them than what they learn; the teaching and learning materials used need to be upgraded to simulate what is expected in the construction industry and finally proper collaboration between the construction industry and TVET institutions in the face of changing technological trends is recommended.

Keywords: Technicians, Workforce, Training, Building Construction.

INTEGRATED TIME AND COST MANAGEMENT SYSTEM FOR PROJECT MONITORING, EVALUATION AND CONTROL

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ABSTRACT

This study presents an integrated time and cost management system for project monitoring, an essential ingredient for project evaluation and control as improper project monitoring normally leads to time and cost overruns and sometimes project abandonment. Project monitoring essentially entails matching cost with time during project implementation. However, there is no clear method of marrying the two as different methodologies are always employed to deal with these two parameters. An implementation plan using network scheduling technique is presented on time-phased graphs (Gantt charts), one on top of the other, the top displaying the actual durations and costs of individual activities during the project implementation stage while the one below shows the budgeted costs and durations of these activities and by extension the cumulative costs over a period. A vertical line passing through the two graphs is drawn at certain intervals or milestones to monitor any variation as to time and cost, and deductions as to the performance of the model is carried out using two UNDP-sponsored borehole projects in Abia State of Nigeria based on Earned Value Analysis (EVA), a methodology used in developing Primavera Software package. Even though the EVA model seems to give impressive results in terms of cost at certain milestones, it lacks the potential of identifying those activities having those costs. This is where the beauty of the proposed model lies, matching time with cost with all the associated activities. The model has helped to curtail the incidence of time and cost overruns and has also proved invaluable in project cash flow forecasting and monitoring, project cost evaluation and project control in general.

Keywords: Network Scheduling, Gantt Chart, Activity-Based-Costing, Earned Value Analysis, BOQ.

THE EFFECT OF MACROECONOMIC POLICIES ON PROJECT (HOUSING) FINANCE IN EMERGING ECONOMIES

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ABSTRACT

Most countries in the emerging economies have their financial institutions regulated by government. With the notion that financial institutions have become less regulated in the developed economies, emerging economies like China, India, Brazil and Nigeria are gradually adopting deregulation as a pivotal form of governance. Various macroeconomic policies adopted in these countries using monetary and fiscal instruments have limited the ability of their financial institutions to provide long term lending in the form of syndicated loans and bond issuance needed for infrastructural development, project finance and in particular housing finance. It is obvious that the housing sector is closely connected to the overall economy, and therefore, macroeconomic instability has a negative effect on the housing market. This paper examines the impact of various instruments of macroeconomic policies on lending activities by the financial institutions to the housing sector. It is concluded that there is the need for the countries in the emerging world to adopt investment friendly and risk averse macroeconomic policies as well as develop the bond and pension fund markets in order to provide the needed finance for the housing sector.

Keywords: Emerging Economies, Developed Economies, Housing Finance, Infrastructural Development, Macroeconomic Policies.

FINDING WAYS FOR ENHANCING POSTGRADUATE LEVEL EDUCATION IN CONSTRUCTION MANAGEMENT IN PAKISTAN

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ABSTRACT

The research paper focuses on the postgraduate level education being imparted in the Engineering Universities in Pakistan and their contribution in the development of local Construction Industry. The Construction Industry is in its infancy as regards to the application of professional management practices in Pakistan. The curriculum of the engineering universities is designed to cater to the needs of the industry but due to the lack of any interaction or feedback from the industry, the universities have not been able to either lead the industry or to equip the students with the knowledge required to meet the demands of this dynamic industry. Moreover, graduates working abroad also face problems in adjusting to fast paced construction management practices and in the use of new technology.

This research paper is basically focused in finding ways for the improvement of the construction industry, primarily based on the development of the human resources in the form of Engineers and Construction Managers, who in turn will be trained to face the current and future challenges faced by the industry. A study has been done to ascertain the student's expectations from these courses, before and after their completion, their improved skills, market demand, etc. An effort has also been made to gauge the industry's perception and expectations from such types of programs. Recommendations have been given for the improvement of the construction industry by focusing on the human resource being trained by the engineering universities.

Keywords: Construction Management, Postgraduate Courses, NED University, Construction Industry, Pakistan

MULTIPLE RESOURCE CONSTRAINT TIME-COST-RESOURCE OPTIMIZATION USING GENETIC ALGORITHM

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ABSTRACT

Simultaneous optimization of time, cost, and utilized resources in a construction project is vital. This paper presents a GA based model for determination of the best combination of the time, cost, and resources in a multiple resource constraint problem. The proposed model considers both resource allocation and leveling simultaneously. Since the problem is assumed to be resource constraint, resource allocations modify the schedules based on multiple resource restrictions. Besides, the basic concept of resource leveling, minimization of M_x (X-moment of resource histogram) is used to minimize resource fluctuation. In addition to M_x, the paper uses M_y (Y-moment of resource histogram) in resource leveling process because simultaneous application of them improves it to take into consideration the resource utilization period. The paper uses weighted sum method for handling multi-objective optimization problem. Performance of the model is illustrated using a simple example project.

Keywords: Time-Cost-Resource Optimization; Genetic Algorithm; Resource Constraint Scheduling; Resource Leveling.

AN IMPROVED LINEAR PROGRAMMING MODEL FOR ONE-DIMENSIONAL CUTTING STOCK PROBLEM

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ABSTRACT

High percentage of yearly construction waste belongs to cutting one-dimensional stocks. Cutting one-dimensional stocks such as steel bars in order to fulfill demanded project lengths, results in trim losses. Although steel waste is recyclable, its reduction might increase the company's profitability.

In construction industry, it is possible to use trim losses from larger diameters for satisfying partial demands in smaller ones. The existing cutting stock models fail to account for this permission. This paper presents an improved linear programming model for cutting stock problem in which trim losses from larger diameters are treated as supplementary stocks to substitute the smaller demands. The model minimizes the total trim loss of the work as an objective function. Performance of the model is illustrated by its application to a hypothetical case example.

Keywords: Cutting Stock Problem, Steel Bars, Linear Programming.

A FUZZY-BASED MODEL FOR UNBALANCED BIDDING IN CONSTRUCTION

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ABSTRACT

Existing unbalanced bidding models assume that quantities of work are certain and deterministic. However in reality some works such as soil and rock excavation cannot be estimated accurately before the work is completely done. In an unbalanced bid, the contractor must take the responsibility of uncertainties in quantities of work. It may be difficult to define probability distribution functions for these parameters due to lack of data and information. This paper presents a fuzzy linear programming (FLP) model of unbalanced bidding which assigns fuzzy numbers to the quantity of works. The model maximizes the present value of the profit as an objective function. Model is applied to a hypothetical case example and compares the results of fuzzy and deterministic models.

Keywords: Unbalanced Bidding, Fuzzy Modeling, Fuzzy Linear Programming.

APPLYING DELPHI METHOD AND DECISION SUPPORT SYSTEM FOR BIDDING

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ABSTRACT

This essay has been presented a Decision Supporting System with an attempt to enhance the Contractor's decision making to participate in tenders based on a logical judgment instead of stochastic decision making. A survey of 42 local and international authorized Contractors has been conducted, subsequently, a data base from questionnaire forms has been created according to Delphi Method, and the practical results established by statistical and expertise analysis.

In account of conformation of all real aspects of the decision making of Contractors and the current situation of construction with the model, all factors has been identified comprehensively, and the Linguistic Variable Tables has been demonstrated to be pointed out by the users.

The presented model is capable to evaluate the decision based on the defined factors and linguistic variable tables and the users are able to evaluate their decision even if they be aware of the value of some of factors.

Keywords: Decision Support System, Delphi Method, Questionnaire, Threshold Value, Killed Value.

SAFETY PERFORMANCE IN CONSTRUCTION INDUSTRY OF PAKISTAN

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ABSTRACT

Traditional measures of safety are after-the-fact measures; namely, that safety is measured after injuries have already occurred. These measures are labeled reactive, trailing, downstream, or lagging indicators because they rely on retrospective data. Focusing on these measures e.g., accident rates and compensation costs often means that the "success of safety is measured by the levels of system failure". In recent years, there has been a movement away from safety measures purely based on retrospective data or ''lagging indicators,'' such as accident rates, toward so-called ''leading indicators'' such as measurements of safety climate. In this paper, safety performance measurement of various construction firms as well as the overall construction industry of Pakistan based on an investigative site survey has been done. Also a comparison of safety performance in the global scenario with that of Pakistani scenario has been presented. Some conclusions and reccomendations have been presented based on the statistical analysis of the data.

Keywords: Safety Performance Measurement, Consatruction Industry, Developing countries, Pakistan.

THE TREND OF BUILD OPERATE AND TRANSFER (BOT) PROJECTS IN PAKISTAN

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ABSTRACT

Build operate and transfer (BOT) term in construction management has been gearing up popularity tremendously in recent times. In developing countries (i.e. Pakistan), where often the owner do not have enough finances to carry out the infrastructure development projects, the BOT can provide the unique opportunity to assist both the financer and the owner. The developing country like Pakistan require extensive infrastructure to meet the various development challenges of future. The governments in the developing countries mostly have the budgetary constraints to commence the development projects. The priorities always remained debatable for the commencement of any government funded infrastructure development project especially in Pakistan. BOT is an option for financing the infrastructure and boost the economical growth of the country with out direct utilization of government finances. In private sector for the owners who have land resources but no finance to make the sufficient development on these lands BOT can be a precious alternate. The BOT projects have the potential to serve the government and private sector with equal effectiveness. BOT projects are also offering attractive opportunities to foreign investors, which in turn can generate substantial foreign exchange for economic growth. Today the Pakistan construction industry has lot of prospects of BOT projects in the fields of power, irrigation, transportation, real estate, highways, multistory buildings and urban development, which can gain the attention of foreign investors. This paper highlight the major BOT projects offered in Pakistan in recent years. This paper will also discuss the major requirements of the BOT projects.

Keywords: BOT, Infrastructure Projects,Developing Countries, Pakistan, Construction Industry.

RESOURCE-CONSTRAINED MULTI-PROJECT SCHEDULING WITH RESOURCE MOVING TIME FOR CONSTRUCTION PROJECTS IN VIETNAM

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ABSTRACT

In the construction project scheduling process, the existing heuristic methods assumed the resource moving time between activities/projects to be negligible. When multiple projects are deployed in different places and far from each other, this assumption has many shortcomings for properly modeling the real-world constraints. Specially with respect to the Vietnam's situation, with a transportation system is still in a backward and low technical standards. Allocating a resource from one project to another is greatly constrained, and it always involves extra costs and time loss. The multi-project duration will be significantly impacted by the resource moving time. This paper proposes a new algorithm named Resource-Constrained Multi-Project Scheduling with Resource Moving Time (RCMPS-RMT) that aims to solve the problem of minimizing construction multi-project duration with the moving time and limited available conditions of renewable resources (labor, machines and equipment). The essence of RCMPS-RMT is based on the improvement of the existing heuristic method–priority rules. In this paper, the computational experiments are also presented to demonstrate that the resource moving time must be included in multi-project scheduling process.

Keywords: Resource Moving Time, Resource Constraints, Multi-Project Scheduling.

QUALITY ASSURANCE AND CONTROL IN THE CONSTRUCTION OF INFRASTRUCTURE SERVICES IN DEVELOPING COUNTRIES – A CASE STUDY OF PAKISTAN

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ABSTRACT

Quality is one of the critical factors in the success of construction projects. Quality of construction projects, as well as project success, can be regarded as the fulfillment of expectations (i.e. the satisfaction) of the project participants. The construction industry in Pakistan has been struggling with quality issues for many years. The construction costs can be significantly reduced if the construction industry embraces the concept of quality assurance and control that has been used with great success by service and manufacturing industries in Pakistan. However, unlike manufacturing and service industries, where a standard product is regularly produced, most products of the construction industry are one-offs, specially designed for a specific purpose. Hence, attainment of a quality level is difficult both to specify and to monitor. In this paper, a case study of the quality assurance and control during the execution of Taunsa Barrage Emergency Rehabilitation and Modernization Project contract packages ICB-01 (Sub-weir, downstream floor of barrage, instrumentation) has been presented. The Taunsa Barrage Project has been considered as a success story in the construction of infrastructure development projects in developing countries. The major part of the civil works of the Taunsa Barrage Project has been completed. This paper is focused on the quality assurance and control using the concept of quality, quality management system (QMS) and quality management system standards in the civil construction works.

Keywords: Quality, Quality Assurance, Quality Control, Civil Works, Infrastructure Projects.

BLACKSPOT STUDY AND ACCIDENT PREDICTION MODEL USING MULTIPLE LINEAR REGRESSION

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ABSTRACT

Factor that affect the risk of increased injury in the event of an automotive accident include reckless driving, environmental factor and roadway condition. The purpose of this study is to develop an accident prediction model for Federal Route 50 by using multiple linear regression analysis. The road accident trend and blackspot ranking were established at Federal Route (FT50) Batu Pahat – Ayer Hitam. It revealed that the percent accident reduction by changing the measures of each variables are, one access point per kilometer reduction can reduce accidents by 9.32 %, 5 kilometer per hour speed reduction can reduce accidents by 27.2%, 100 vehicle per hour volume reduction can reduce accidents by 4.33 % meanwhile an increment of one second in gap will reduce accident by 1.20%.

Keywords: Blackspot Ranking, Accident Prediction Model.

USE OF TRAFFIC SIMULATION MODEL AS INTELLIGENT DECISION SUPPORT SYSTEM IN DEVELOPING COUNTRIES

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ABSTRACT

Traffic Simulation Models have their applications as decision support system for management and project evaluations around the world. For example, the policy makers in Brussels have used simulation models as a decision support to evaluate the strategies for improving the operational efficiency of inter-modal transport. Road network infrastructure development and management projects require large amount of finances for field experiments, which shall prove costlier for developing countries. This paper aims to discuss the use of simulation tool and its results to support the selection of proposed strategy in the study area. A methodology for developing countries is presented that supports the decision of selecting a particular management strategy for improving existing traffic operational conditions. An Intelligent Transportation System (ITS) based traffic management model requires a number of decision support systems. Traffic management is not only a costly but also continues over time. It starts with identification and prioritization of problems and solutions ranked by stakeholders' group in the initial stages. With traffic data of relatively high accuracy being collected from the field using advanced equipments, simulation models are calibrated for local traffic. Improvements in operational performance require management strategies to be incorporated into the system. Results obtained from these simulation tools compare alternate improvement strategies, and solutions thus giving the best possible solution. This paper presents the development of traffic simulation model for weaving/merging areas validated by applications in existing scenarios. It concludes that traffic simulation models have potential to be used in development of a decision support system as a part of traffic management model.

Keywords: Traffic Simulation Models, Decision Support System, Traffic Management.

ISSUES IN CURRICULUM DEVELOPMENT FOR M. TECH IN CONSTRUCTION MANAGEMENT IN DEVELOPING COUNTRIES

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ABSTRACT

Today if we go through the syllabi of Civil Engineering graduate program, most of the time we discover that cost and construction aspect are missing or is covered in a very prosaic manner. The area of construction management has not received its due place in the Civil Engineering program run in developing countries like India. Since construction activities are carried out mostly at the construction site, which are usually far flung from main cities, the academician/authors, and the faculty may not be aware of the practical difficulties and nuances of construction management. These might be the reason that construction management has not received due place in the institutes, universities, colleges and in many management books.

Today, due to increased competition and the capital that is scarce, large constructions like metro rail, high-rise building cannot be handled without the use of modern construction equipment and modern construction and management techniques to reduce time and to maintain higher standards of construction quality. It is necessary to use modern machinery and latest construction management tools to optimize the construction activity and to improve the productivity.

This is high time for the countries of Indian sub-continent to pay due attention to this commercially valued knowledge, which is directly related to infra structure development, and in turn with national economy. One-way of introducing subject is to copy the syllabus of any reputed institute. In this paper various issues related with curriculum development for M Tech in Construction Management has been discussed. The paper concludes on the theme that such course should be field-oriented and should really add value to human capital, as opportunity cost of education is very high in developing countries.

Keywords: Construction Management, Curriculum, Costing and Construction.

AN ASSESSMENT OF GENERAL TRENDS ADOPTED FOR BIDDING AND PROCUREMENT IN THE CONSTRUCTION INDUSTRY OF PAKISTAN

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ABSTRACT

The construction industry and its clients are widely associated with Bid and Procurement issues. These issues are different depending upon nature of construction business activities, processes, environment and organization. Bid and Procurement is a substantial and integral element of Construction project management. It has been the issue of attention in the construction world. Due to time and cost overruns associated with construction projects, so many projects fail to accomplish their targets and objectives. Unmanaged or unmitigated bidding and procurement procedures are one of the fundamental causes of these overruns. In Pakistan and other under-developed countries, the most common method of awarding the contract is the Low-Bid or Priced Based method, which has inherent flaws of high competition and minimum performance. On the other hand, these days, developed countries are using alternate bidding systems such as Best Value Procurement method for awarding a contract with basic characteristics of high performance and high competition to meet the main objective of quality of the Construction Industry. The core objective of presenting the study is to highlight the trends and flaws in the bidding and procurement practices in construction industry of Pakistan, specifically in government sector projects. A set of recommendations has been presented based on surveys results and interviews for improvement of these trends.

Keywords: Construction Management, Bid Procurement, Lowest Bidding Environment, Best Value Procurement, Pakistan

LINEAR PROGRAMMING FOR OPTIMIZING STRATEGIC CONSTRUCTION WORKFORCE MANAGEMENT

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ABSTRACT

One of the most important factors in construction project management is to provide skilled labor relevant to the technical project requirements. Major problem in this field is shortage of skilled labor. A key reason for this problem is the absence of human resource management strategy for construction project. To choose an optimized strategy for making the best use of available workforce with the intent to reduce project costs. This paper presents a model to combine training and hiring workforce in different levels of skills. Linear programming is used for solving this model to achieve optimized solution. The input data to proposed model consists of certain available labor pool, cost configures for training workforce in different skills, the cost of hiring workforce, hourly labor wages, and estimates of affinities among the different considered skills and their levels. Therefore, project manager or decision maker by using this model and paying attention to condition of training and hiring workforce will be able to make best decision to minimize project costs.

Keywords: Resource Management, Linear Programming, Training, Hiring.

A STOCASTIC-SIMULATION MODEL FOR LOWEST BID PRICE EVALUATION: A CASE STUDY IN ROAD CONSTRUCTION AND REHABILITATION PROJECTS IN LEBANON

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ABSTRACT

Competitive bidding is required by law in all public construction projects in Lebanon. The qualified contractor submitting the lowest bid price is awarded the contract. Evaluating the lowest bid price at a pre-contract stage is of a great concern to any contractor working in the Lebanese highly competitive market. This enables the contractor to make a strategic decision in choosing an appropriate bid price that will offer a satisfactory profit with a greater probability to win. A stochastic-simulation model for the lowest bid price evaluation in the bidding process adopted in Lebanon especially in public road construction and rehabilitation projects is developed in this study. The model, built using Crystal ball decision-engineering software, considers two main factors influencing bidding behavior, namely the project size represented by the average bid price and the competition presented by the number of qualified participating bidders. Historical data of 275 bidding attempts collected from the archived records of the Council of Development and Reconstruction in Lebanon (CDR) formed the basis of the data analyzed. A regression relationship between the lowest bid price, the average bid price, and the number of qualified bidders is also developed and used in building the model. The validity of the model is checked. Results show a mean deviation of only 2.6% between the actual lowest bid price and the evaluated values. The proposed model also provides a framework that can be used by a specific contractor to decide on his bid price with associated certainty levels in a scientific method.

Keywords: Competitive Bidding Process, Simulation, Lowest Bid Price.

CONSTRUCTION RISK INSURANCE PRACTICES IN PAKISTAN

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ABSTRACT

Construction works by nature are hazardous and accidents are frequent and often severe. The annual toll of deaths, bodily injuries and property damage in construction world is very high. Not only this but construction works involve large amount of investment especially in public projects. All of this increases the risk of construction business and makes handling of financial matters more critical. Insurance and Surety are some of the methods utilized by the contractors and client as risk controlling mechanisms.

Risk insurance helps the contractor transferring its risk related to unforeseen circumstances which has a potential risk of damage to life, property, material or equipment. The study aims at highlighting the current insurance practices of the construction industry of Pakistan. A distinguishing approach of targeting insurance companies will be used for data collection in this regard.

The study will be beneficial for developing sets of recommendation for the construction industry and financial institutions to highlight and improve the shortcomings of the current practices. It will serve as an initiative to academia for further research.

Keywords: Construction Industry, Risk, Insurance, Risk Transfer, Pakistan

FAILURE OF OVERHEAD WATER TANK IN THE STATE OF UTTAR PRADESH IN INDIA-A CASE STUDY

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ABSTRACT

The state government of Uttar Pradesh had launched the safe drinking water project for rural population living in remote areas. The job of implementation of the scheme was given to the corporation "JAL NIGAM" which deals with the public water management in the state. However the project was a failure. At last the problem was referred to the department of civil engineering for the remedial measures. After minute study of the problem, it was observed that various phases of project life cycle were not tested on the test stone of money, man, material, machine, maintenance and lastly wrong selection of technology for constructing the tank. In this paper it has been concluded and emphasized that in civil engineering projects, availability of raw material at site, regular cash flow, availability of suitable human resource, appropriate technology, availability of sinking fund, local sociology and psychology of the local people should never be ignored for making the project a success.

Keywords: Project, Water Management, Human Resources and Maintenance.

OPTIMIZATION OF UNCERTAIN CONSTRUCTION TIME-COST TRADE-OFF PROBLEM

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ABSTRACT

Time–cost optimization (TCO) may be defined as a process to identify suitable construction activities for speeding up, and for deciding "by how much" so as to attain the best possible savings in both time and cost. In reality due to different uncertainties, the actual cost and time of each option is not certainly known for the manager in advance. Therefore, total time and cost of project may differ significantly because of these uncertainties. In this paper, fuzzy logic theory is employed to consider affecting uncertainties in total time, direct and indirect cost of a construction project. A multi objective optimization algorithm based on genetic algorithm (GA), is applied to provide a trade-off between implementation time and total cost. Project manager can also have different non-dominated solutions or Pareto solutions which are dependent on his measure of accepted risk through applying α-cuts methods in fuzzy logic theory. The proposed model leads the decision maker to select the desirable Pareto front solution through acceptable value of α-cut.

Keywords: Time-Cost, Trade Off, Fuzzy Theory, GA, Decision Making.

UNCERTAIN SCHEDULING BASED ON ACCEPTED RISK LEVEL AND OPTIMISM OF A PROJECT MANAGER

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ABSTRACT

Uncertainties in scheduling are an issue that is addressed in the PERT or GERT to complement CPM. PERT and GERT are probabilistic approaches that consider variability in the duration of each activity. For new activities or the lack of statistical data, probability distributions for some activity duration times may be unknown or just partially known. In this case, probability theory may be replaced by fuzzy set theory. In this research, a new approach is presented to scheduling, which employs fuzzy sets theory to considering uncertainties in activities execution times. The model fully embeds fuzzy presentation of the uncertainties in duration of activities into the model structure. Accepted risk level and optimism of the project manager in decision making are defined through α-cut approach and optimism index (β**)** respectively. Different values of α and β leads to different scheduling. In order to test the performance of the model, an 18 activity problem has been modeled and the results are discussed. Solution to the model provides the project manager with an implementation time and corresponding membership function, which may help him in decision modeling process.

Keywords: Scheduling, Fuzzy Theory, Uncertainty, Risk Acceptance Level, Optimism.

AGGREGATE CHARACTERIZATION - AN IMPORTANT STEP TOWARDS ADDRESSING CONSTRUCTION ISSUES IN PAKISTAN

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ABSTRACT

Aggregate is a material vastly used in the construction industry related to concrete structures, asphalt bases and pavement. To achieve required dimensional stability, durability and strength of structures, aggregate characteristics and related engineering properties is one of the main issues needed to be addressed. The city of Karachi is receiving massive quantities of aggregates supplied by several sources present within and along its periphery, however, no concerted effort has been witnessed to document aggregate characteristics, leading to all sort of durability problems and threatening service life of structures. There is a dire need to develop a data-base that contributes to the suitability of material in asphalt and concrete mix. Aggregate characterization technique is a forefront vision to enhance the quality of HMA and concrete along side being a pioneering move to select construction materials. It focuses on quality and performance in roads and buildings and determines suitability of their use in Hot Mix Asphalt and Concrete Mix Design, thus addressing issues related to applicability in given situation, strength, durability and maintenance and monitoring and rehabilitation.

This paper aims to present a methodology for aggregate characterization based on their physical properties, petrography examination and engineering properties. Visits of construction sites in all eighteen towns of Karachi city revealed that Hub River is the major source of raw material. Based on experimental design formulated to evaluate the physical properties and engineering behaviour of rocks and crushed rock respectively, statistical techniques have been applied to ascertain significance of relationships between various properties governing aggregate characterization. Conclusions are drawn

regarding suitability of characterization of aggregates in relation to their construction application and ability to address construction related problems. The aggregate characterization model thus developed has the capacity and potential to be utilized and extended for various scenarios.

Keywords: Aggregate Characterization, Engineering Properties, Petrographic Studies.

ASSESSMENT OF CRITICAL SKILLS FOR PROJECT MANAGERS IN PAKISTANI CONSTRUCTION INDUSTRY

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ABSTRACT

An effective project manager is the cornerstone in any successful project. The three parties involved in design and execution (owner - architect/engineer - contractor) are always looking for effective project managers in order to successfully deliver projects. However, the opinions about the qualitative skills that are evidenced by successful project managers are subjective. The purpose of this study was to identify the most important skills of successful project managers as perceived by the major stakeholders in the construction industry. A questionnaire was circulated among owners, developers, general contractors, subcontractors, architect/ engineers and construction managers wherein they were asked to give importance rating to twenty skills usually required in a project manager. Based on the results of the survey, it is anticipated that patterns will emerge regarding the key characteristics of effective project managers. These results could then be used in the identification and development of effective project managers.

Keywords: Critical Project Management Skills, Construction Industry, Pakistan

APPLICATIONS OF NANOTECHNOLOGY AND NANOMATERIALS IN CONSTRUCTION

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ABSTRACT

Nanotechnology is one of the most active research areas with both novel science and useful applications that has gradually established itself in the past two decades. Expenditure on nanotechnology research is significant; however, the research is continuously moving forward motivated by immediate profitable return generated by high value commercial products. The Architecture, Engineering, and Construction (A/E/C) industry might accommodate broad applications of nanotechnology and nanaomaterials. It has been demonstrated that nanotechnology generated products have many unique characteristics, and can significantly fix current construction problems, and may change the requirement and organization of construction process.

This paper examines and documents applicable nanotechnology based products that can improve the overall competitiveness of the construction industry. The areas of applying nanotechnology in construction will be mainly focus on: (1) lighter and stronger structural composites, (2) low maintenance coating, (3) better properties of cementitious materials, (4) reducing the thermal transfer rate of fire retardant and insulation, and (5) construction related nano-sensors.

Keywords: Nanotechnology, Nanomterails, Construction.

NONLINEAR DYNAMIC BEHAVIOR OF COLD-FORMED STEEL PIPE PIER MODEL USING SHAKING TABLE TEST

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ABSTRACT

An experimental program comprising static cyclic loading and dynamic loading tests of steel pier models is undertaken. In order to establish a rational design method of steel bridge piers against severe earthquakes, the experimental program is aimed to address some fundamental questions concerning the correlation between the two loading modes with reference to capacity of measuring the dynamic responses. To that end, the effects of loading modes on strength and ductility of steel pier are examined on the basis of the experimental results. Some of the results clearly point that the static cyclic loading test has an inadequate ability to evaluate the seismic performances of steel piers under dynamic loading.

Keywords: Seismic Design Method, Cyclic Loading Test, Dynamic Loading Test, Shaking Table Test.

ASSESSMENT OF DEMING'S PHILOSOPHY WITH RESPECT TO ITS LINK TO THE CURRENT SCENARIO IN PAKISTANI CONSTRUCTION INDUSTRY

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ABSTRACT

Deming, who is known as the father of Total Quality Management, gave his fourteen points on Quality Management which are still regarded as milestones in this field. Although it is a management theory but it can be applied to any industry which deals with the provision of products and services. Deming advocates a constant improvement in the quality of products and services by effective management and by using statistical control tools and procedures. In this research paper an effort has been made to link Deming's fourteen points with the Construction Industry in Pakistan and to find ways for the improvement of the industry both in terms of its image as well as in terms of products and services that it offers. Each point has been discussed in the context of the Deming's Philosophy and the prevailing conditions in the Construction Industry in Pakistan, the current practices and the management framework. The methodology adopted for this research paper has been desk study, personal observations and collection of data from the construction industry in Pakistan. Finally, recommendations have been given based on the analysis and feedback.

Keywords: Deming, Total Quality Management, Quality Management, Construction Industry, Pakistan.

PRODUCTION OF LOW COST SELF COMPACTING CONCRETE USING RICE HUSK ASH

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ABSTRACT

Self Compacting Concrete—as the name implies—is the concrete requiring a very little or no vibration to fill the form homogeneously. Self Compacting Concrete (SCC) is defined by two primary properties: Ability to flow or deform under its own weight (with or without obstructions) and the ability to remain homogeneous while doing so. Flowability is achieved by utilizing high range water reducing admixtures and segregation resistance is ensured by introducing a chemical viscosity modifying admixture (VMA) or increasing the amount of fines in the concrete. The study explores the use of Rice Husk Ash (RHA) to increase the amount of fines and hence achieve self-compactibility in an economical way, suitable for Pakistani construction industry.

The study focuses on comparison of fresh properties of SCC containing varying amounts of RHA with that containing commercially available viscosity modifying admixture. The comparison is done at different dosages of superplasticizer keeping cement, water, coarse aggregate, and fine aggregate contents constant.

Test results substantiate the feasibility to develop low cost SCC using RHA. Cost analysis showed that the cost of ingredients of specific SCC mix is 42.47 percent less than that of control concrete.

Keywords: Self Compacting Concrete, Rice Husk Ash, Flow ability, Segregation Resistance.

THE ACPROM MODEL: AN EXPERT SYSTEM FOR EVALUATING THE CONSTRUCTION PROGRESS

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ABSTRACT

A persistent problem in construction is to documenting changes which occur in the field and preparing the as-built schedule. In current practice, deviations from planned performance can only be reported after significant time has elapsed. And manual monitoring on construction sites is costly and error prone. Availability of advanced portable computing, multimedia and wireless communication allows, even encourages fundamental changes in many jobsite processes. However a recent investigation indicated that there is a lack of systematic and automated evaluation and monitoring in construction projects. Consequently the aim of this study is to identify techniques, which are used in the construction industry for monitoring and evaluating the actual physical progress, and to establish how the current computer technology can be used for monitoring the construction physical progress on site. This research presents a prototype expert system, namely Automated Construction PROject Progress Monitoring (ACPROM) system, developed for integrating construction drawings, digital images of construction site progress and construction schedule. Using emerging technologies and information systems ACPROM model suggests new process or reengineer the traditional AEC field inspection process This system can automatically interpret the CAD drawing of a building and extract data of its structural components and develop the data base and simultaneously extract the information from digital images and by simulating these two databases the percentage of progress will be calculated and actual physical progress bar chart will be developed automatically. ACPROM provides a bridge for storing structural design information in an integrated construction relational data-base management system that can be shared by a range of computer applications. ACPROM model is part of developing the Tele-Construction base site management system, which retrieves the status of construction work in progress and develop the actual progress bar-chart of work. The application of ACPROM model in monitoring the progress enables project management teams to better track and controls the productivity and quality of construction projects. The use of the ACPROM can help resident engineer, construction manager and site engineer in monitoring and evaluating project performance. This model will improve decision-making process and provides better mechanism for advanced project management.

Keywords: As-Built Schedule AutoCAD, Digital Photographs, Progress Reporting, and Project Monitoring.

ROLE OF CONSTRUCTION SECTOR IN ECONOMIC GROWTH: EMPIRICAL EVIDENCE FROM PAKISTAN ECONOMY

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ABSTRACT

Construction sector and construction activities are considered to be one of the major sources of economic growth, development and economic activities. Construction and engineering services industry play an important role in the economic uplift and development of the country. It can be regarded as a mechanism of generating the employment and offering job opportunities to millions of unskilled, semi-skilled and skilled work force. It also plays key role in generating income in both formal and informal sector. It supplements the foreign exchange earnings derived from trade in construction material and engineering services.

Unfortunately construction sector is one of the most neglected sectors in Pakistan. Although the construction sector has only a 2.3 percent share in GDP, its share of the employed labor force was disproportionately large at 6.1 percent in FY07.

The construction sector is estimated to have grown by 17.2 percent in 2006-07 as against 5.7 percent of last year. The higher demand for construction workers is also reflected in a continued double-digit rise in their wages since FY05. Their wages increased by 11.1 percent in FY07.

The purpose of this study is:

- To examine the contribution of construction sector in Pakistan economy.
- To identify the relationship between construction sector and economic growth in the case of Pakistan and
- To identify whether there is a unidirectional or bidirectional causal relationship.

Keywords: Construction Sector, GDP, Causal Relationship, Co-integration.

RISK IDENTIFICATION FOR INTERNATIONAL JOINT VENTURE CONSTRUCTION PROJECTS

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ABSTRACT

Risk identification is very important for all construction projects and its importance become significant on international level especially in multicultural environment. It includes identification of risks and probable impact of these identified risks in construction projects. It plays a vital role for successful project delivery and increase efficiency and profitability of construction projects. New opportunities are continuously emerging as a result of globalization in construction sector to have projects internationally. Joint venture construction projects are now very common which results in increased organizational exposure to worldwide business market.

Risks in international construction projects are more critical as compared to domestic projects. And they become more critical when developing countries like Pakistan involved in international joint venture construction projects. That's why it is desirable for construction firms in Pakistan to identify the risks and find probable impact of these risks as early as possible, so that suitable strategies are made before actual execution of project on international level. Objective of this paper is to identify risks and find the impact of these risks in international construction joint ventures. This paper presents the findings of survey conducted through questionnaire, to identify the risks significant for international construction projects and impact of these risks as perceived by stakeholders involved including; clients, consultants and contractors. In addition it includes meaningful recommendations and conclusions.

Keywords: Risk Identification, Globalization, Construction Projects, Cross Cultures, Joint Ventures.

APPLICATION OF PUBLIC PRIVATE PARTNERSHIP (PPP) IN HONG KONG SPECIAL ADMINISTRATIVE REGION – THE CRITICS' PERSPECTIVES

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ABSTRACT

The term Public Private Partnership (PPP) indicates the two main parties who are involved in the process. Although the views from the public and private sectors are important, it is also interesting to realise the critics' perspective on conducting PPP projects in the Hong Kong Special Administrative Region (referred to as Hong Kong from here onwards). Therefore as part of a comprehensive research study looking at implementing PPPs in Hong Kong, face-to-face interviews with experienced local industrial practitioners were conducted. Amongst these interviews, three were launched with experts from outside the public or private sectors. These interviewees included an academic and two legislative councillors from Hong Kong. This paper presents the analysis of these interviews which helps to fill in the gaps unrealised by the public and private sectors. The academic view is that further research was needed on how to decide on the concessionary period of the projects. Also, relational contracting could be considered in PPP projects. A regulation system for projects was necessary and a public sector comparator should be adopted. Projects with fewer competitors would be appropriate for PPP such as infrastructure, power transmission or network, and water and gas supply. In addition, due to the high costs involved in PPP projects those with a larger project sum would be considered to provide a better business case for the private sector. The legislative councilors suggested that the most ideal projects would be those that were task specific, and where the timeline and milestones would be foreseeable. The project nature itself would not be important. Critical success factors identified by the academic included: Government to leave more flexibility rather than prescribing specification; Clear legal structure and regulation mechanism; Business case; Technical and financial

capability of concessionaire; and Fair handling of risks. The legislative councilors also suggested that PPP must have Clear objectives; Transparent approach; Adequate public consultation; Clear output specification and timeframe; Political environment; and Administration / financial services lead. Other problems related to PPP projects raised by one of the legislative councilors included the tendency in Hong Kong for projects to be labeled as 'PPP' when actually they are not of the same nature.

Keywords: Public Private Partnerships (PPP), Procurement, Infrastructure Projects, Hong Kong.

MODELING SUBCONTRACTORS COOPERATION IN TIME; COOPERATIVE GAME THEORY APPROACH

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ABSTRACT

Time, as one of most important factors in a successful construction project, can be traded between subcontractors in sequential projects. In optimal case for trading time, subcontractors have reasonable incentive to cooperate. In this paper we introduce a new problem in field of subcontractors cooperating and then we propose a model to solve it. Finally, a case study is represented to more comprehensively illustrate the problem. Results from utilization of the propossed model show that while optimizing total cost, all subcontractors can negotiate to fairly distribute benefits from cooperation in core space. The Shapley value and the nucleolus concepts can be suggested as well.

Keywords: Construction Management, Subcontractor, Cooperative Game Theory, Cost Allocation.

ANALYSIS OF THE USE OF PERFORMANCE INFORMATION IN THE CONSTRUCTION INDUSTRY

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ABSTRACT

In 2006, the CIB commissioned the formation of Task Group 61, which was charged with capturing the use and impact of performance information in the construction industry around the world. This paper documents what the initial efforts of the group and a literature review have discovered and presents a model for a "living literature database" that is linked directly to a new CIB journal in performance information. The key findings of the research focused on identifying where performance information is used with the express objective to change the expected behavior and performance of the contractor on specific construction projects. There are three main groups of research which chronicle the use of performance information in construction: 1) Research that identifies a need for performance information to be used in the industry, 2) Research that propose a system or method for gathering and using performance information and ran a case study or test, and 3) Research that chronicles a system whose users are continuously implementing performance information to increase performance within the industry. A search of over 3 million articles, with 4,500 of those reviewed in detail, revealed that over the past 15 years, only 16 research articles have been published that chronicle a performance information system that has sustained usage and results. There is a need for performance information research in construction.

Keywords: Performance Information, Performance Measurements, Benchmarking, Contractor Performance.

MOVEMENT OF THE LATEST CUTTING EDGE PROJECT MANAGEMENT/DELIVERY SYSTEMS TO THE UNIVERSITY OF BOTSWANA

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ABSTRACT

A new project management (PM) model for construction and other services delivery, the Performance Information Procurement System (PIPS), has been developed at Arizona State University. The leadership based model varies from traditional management by using principles of simplicity, logic, efficiency, alignment, accountability, and preplanning. The new PM model minimizes many of the issues of more developed construction industries, and has the capability to assist less developed countries in avoiding ineffective, management based practices. The hypothesis being proposed is that a country without years of experience and mature project management programs can utilize the simplicity and logic of the new process that minimizes the need for very experienced construction/project management and motivates the less mature construction industry to more quickly and efficiently build its construction workforce. The PBSRG group also hypothesizes that the new PM model may be easier to implement in a developing industry rather than in a well developed industry, which has years of implementing the traditional PM model. The Fulbright program is sponsoring the movement of the new PM model into the African continent.

Keywords: New PM Model, leadership Based PM Model, Technology Transfer.

PERCEIVED RISK ALLOCATION IN PUBLIC-PRIVATE-PARTNERED (PPP) WATER SUPPLY PROJECTS IN INDONESIA

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ABSTRACT

A Public-Private-Partnership (PPP) water supply project typically involves a plethora of risks. Because a PPP is nothing other than a transfer of project risks traditionally borne by the government to the private sector, proper risk identification and allocation is a key to successful PPP project implementation. This paper presents and discusses the industry's perception of the optimal risk allocation in the context of Indonesian PPP water supply projects. The paper has identified a total of 39 project risks, classified them into six categories. Qualitative assessments of individual risks were elicited from an industry survey of respondents' opinions via a mail-based questionnaire. The central tendency of risk allocation as measured by the mode value confirms the intuition and theory that risk must better rest with the party who has control or better manage it. However, the findings also suggest that balancing project risks remain elusive, which is indicated by a high disagreement level amongst respondents.

Keywords: Indonesia, Public/Private/Partnership, Water Supply Projects, Risk Allocation.

A STRATEGY FOR UPGRADING BRIDGE INFRASTRUCTURE NETWORK

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ABSTRACT

Bridges are important links in the road network. Over the years, bridges have been designed to various standards as they were built in different periods. The road infrastructure grew as the country developed and the population spread out. The technology also has significantly developed resulting in better understanding of bridge structures and their behaviour. As funds availability is tightened, road authorities are facing challenges related to the implementation of optimal bridge management programs based on lifecycle cost, remaining life and bridge capacity considerations. In this context, this paper presents the Australian experience in managing bridges, and proposes a strategy to upgrade bridges on sub-networks in a proactive way in anticipation of new operational loads or legal limits being imposed. The paper also provides an example illustrating the applicability of proposed strategy.

Keywords: Bridges, Capacity, Infrastructure, Lifecycle Costing, Road Network.

DEVELOPMENT OF A FUZZY RISK ASSESSMENT AND CONTRACTUAL ALLOCATION MODEL FOR IRAN'S DAM CONSTRUCTION PROJECTS

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ABSTRACT

On-time completion and conformity with assigned costs of every project or plan is one of the most important factors in success of that project or plan. No completion or overrun cost leads to not meeting the employer's requirements need or goals of the plan or the project. This issue is of greater importance in large and national projects in which the period of execution is long even in normal conditions and takes more than 6 years averagely.

Dam construction projects are of especial importance regarding on-time completion and assigned funds because of their importance in operation size, great investment, complicated nature and many uncertainties in them like underground conditions, natural disasters, and high cost of construction. So, inspection, identification and evaluation of causes of cost and time overrun and representations of solutions for obviating them have great benefits for economy of the country. Besides in most cases precise and sufficient information is not available for this purpose and opinions of experts and professionals in this project (in fuzzy theory framework) should be used. This study presents schedule delay analysis methodology based on fuzzy theory and represents contractual allocation of risk based on type of contracts in dam construction projects. For analysis purpose the data collected from nine dams in Iran.

Keywords: Time and Cost Overrun, Fuzzy Risk Assessment, Risk Allocation, Delays, Dam Construction Projects.

COMPARISON OF PUBLIC PROCUREMENT OPTIONS UNDER PPRA-2004 RULES

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ABSTRACT

Public Procurement Regulatory Authority (PPRA), has been constituted thorough an Act of Parliament of Pakistan in 2004. The major objective of PPRA-2004 rules is to ensure transparent and cost effective procurement of quality goods and services in the public departments. The rules provide various procurement options, which can be applied to the construction and infrastructure projects as well. In this paper, different procurement options have been analyzed in terms of their strengths and weaknesses for construction project in Pakistan. It has been observed that if these rules are carefully followed, with professional knowledge, technical skills and ethical integrity, the procurement process can be made more effective and results oriented.

Keywords: Public Procurement, Construction Projects, Pakistan.

THE INVESTIGATION OF DESIGN-BUILD VARIANTS IN CONSTRUCTION MARKET OF THE PEOPLE' REPUBLIC OF CHINA

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ABSTRACT

Design-Build (DB) system has been widely adopted overseas but it has not received the same popularity yet in the People's Republic of China. The selection of design-build variant is regarded as one of the critical obstacles to the application of this alternative. This paper investigates categories of design-build variants in the construction market of China. The develop-and-construction, enhanced-design-build, traditional-design-build and engineering-procurement-construction (EPC) are the four current design-build variants adopted by clients. Each of them is developed to meet a varying set of circumstances and has its own advantages and disadvantages. The develop-and-construction is mostly used in large, complex projects in housing industry and it will guarantee client's great control over the project while still leave some design room for the contractor. The traditional-design-build and enhanced-design-build systems are mostly applied in projects that are comparatively simple, small-scale, and the DB contractors will have greater control of the projects. The EPC is the extension of pure design-build method and is widely adopted in the petrochemical, metallurgical and electronic fields because of the high-technique requirements and the necessity for one entity to control the design, construction, procurement and commissioning etc. Four corresponding design-build projects are also presented in this paper in order to better illustrate the operational process and provide the insight for understanding the design-build variants in Mainland China.

Keywords: Design-Build, Variants, Case Study, China.

ASSESSMENT OF CRITICAL SUCCESS FACTORS FOR CONSTRUCTION PROJECTS IN PAKISTAN

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ABSTRACT

The construction industry is dynamic in nature due to the increasing uncertainties in technology, budgets, and development processes. Nowadays, building projects are becoming much more complex and difficult. The project team is facing unprecedented changes. The study of project success and the critical success factors (CSFs) are considered to be a means to improve the effectiveness of project. However the concept of project success has remained ambiguously defined in the mind of the construction professionals. Consequently, this research is conducted in order to make an attempt to identify which variables influence the success of project implementation. Based on the results of the survey, we anticipate that patterns will emerge regarding the key performance indicators for measuring project success. These results could then be used in effecting successful projects. This study has chosen seventy seven (77) factors categorized in seven (7) groups that the questionnaire respondents were asked to rank and score.

Keywords: Critical Success Factors, Construction Projects, Pakistan, Key Performance Indicators

SKILLED LABORER MANAGEMENT IN HANDLING CONCURRING BUILDING PROJECTS AT MULTIPLE SITES: THE BAR BENDERS JOB SCHEDULING PROBLEM

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ABSTRACT

The purpose of this study is to address the challenges in single-skilled labor resource management and scheduling under the functional organization structure. The problem of skilled laborer scheduling in a multi-project context is elucidated through a case study of allocating bar-bender resources to three concurring sites. Factoring in technological constraints, repetitive building cycles, alternative method options, limited quantity of skilled laborers, and labor work calendars, we resort to computer power (including simulation and optimization algorithms resulting from recent research) in search of the best combination of construction methods at individual sites and the optimum size of labor force that would lead to the shortest duration of completing the jobs at all site. The resulting substantial reduction in the job's duration comes solely from improvements in the efficient use of time and budget. That would deliver cost savings to the subcontractor and justify a pay raise increase for the laborers.

Keywords: Project Scheduling, Resource Allocation, Optimization Analysis.

FINANCIAL MANAGEMENT OF CONSTRUCTION CONTRACTS (CONSTRUCTABILITY AND ITS RELATION WITH TQM, COST SHIFTING RISK AND COST/BENEFIT)

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ABSTRACT

Financial Management, Book Keeping and Recognition of Construction contracts is now considered as a unique professional job due to its recognition by IASB (International Accounting Standard Board) through IAS (International Accounting Standard) 11. IAS 11 specifically deals with Construction Contracts. This very standard has provided the basis for Constructability. Constructability has received considerable attention from researchers and practicing engineers and other professionals. This is a fact that Constructability has been associated with Total Quality Management (TQM) and Value Engineering. This paper attempts to conceptually describe Cost shifting Risk, Cost/Benefit analysis as well as the evolution of constructability in relation to IAS 11.In addition, the paper presents a framework to measure recognition of Cost and revenues related to Construction Contracts.By providing professionals with this framework, the parameters will be visible and defined, thus removing skepticism as to the financial management as well as enable more consistent and uniform results to be obtained. Additionally, this paper will provide Framework for the Preparation and Presentation of Financial Statements to determine when contract revenue and expenses in the income statement.

Keywords: Financial Management, Construction Contracts, Constructability.

CONSTRUCTION PROCESS COST MODEL (CPCM) APPLIED TO THE TENDERING PROCESS

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ABSTRACT

Continually improving the quality of a project has always been one of the major concerns to construction companies. Quality improvement of a project helps construction companies to avoid unnecessary construction expenses and lengthy delay. A Construction Process Cost Model (CPCM), based on Part 1 of the British Standard BS 6143 – Process cost model (PCM), has been introduced in previous studies as one of the tools to measure quality improvement of construction processes. Users of the model could choose particular process(es) in a construction project for monitoring and therefore resources could be more effectively utilized. Previous researches in the application of CPCM to non-construction/non-technological processes such as planning, design and staff training have been successfully conducted. It can be shown that the application of CPCM is not only feasible in construction processes but also in non-construction/non-technological processes. As a further work of the previous studies, this paper discusses a case study on using CPCM to monitor the quality of another non-construction/non-technological process — the tendering process of a construction project in Hong Kong. The case study verifies that CPCM is both applicable and practical. It can also be used as a tool to monitor the "process continual improvement", a requirement stated in the latest (year 2000) version of the ISO 9000 quality management system.

Keywords: Construction Process Cost Model, CPCM, Tendering, Quality Cost, Quality Management, Hong Kong.

BUILDING INFORMATION MODELING (BIM): A NEW PARADIGM FOR VISUAL INTERACTIVE MODELING AND SIMULATION FOR CONSTRUCTION PROJECTS

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ABSTRACT

The Architecture, Engineering and Construction (AEC) industries have long sought techniques to decrease project cost, increase productivity and quality, and reduce project delivery time. Building Information Modeling (BIM) offers the potential to achieve these objectives. BIM represents the development and use of computer-generated n-dimensional (n-D) models to simulate the planning, design, construction and operation of a facility. It helps architects, engineers and constructors to visualize what is to be built in simulated environment and to identify potential design, construction or operational issues. BIM represents a new paradigm within AEC, one that encourages integration of the roles of all stakeholders on a project. It has the potential to bring about great efficiency as well as harmony among players who all too often in the past saw themselves as adversaries. In this paper, the benefits of Building Information Modeling (BIM) for the AEC industries are discussed with the help of two case studies. These case studies illustrate the various tangible and intangible benefits achieved by all stakeholders by implementing BIM in their projects. At the end, light is thrown on various BIM related risks and future challenges for the AEC industries.

Keywords: Building Information Modeling (BIM), Virtual Design and Construction (VDC), n-Dimensional Modeling, Parametric Modeling, Facilities Management (FM).

ROLE OF OPEN AND DISTANCE LEARNING IN THE EDUCATION OF ENGINEEERS FOR SUSTAINABLE BUILDING DESIGN: A CASE STUDY OF ALLAMA IQBAL OPEN UNIVERSITY

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ABSTRACT

Open and Distance Learning (ODL) provides a unique opprtunity to prefessionals for their continuing education and capacity building. Allama Iqbal Open University (AIOU), Pakistan had been a succesful enterprise with an objective to addresses the education needs of masses in the country. Contiuing education of Civil Engineers in Pakistan is the most neglected part of our education System. AIOU in collboration with British Council of Paksitan, tailored a post graduate degree and diploma program in Environmental design for Engineers, Archeticts, town Planners and interior designers in 2003, which presents a number of futuristic strategies that can be used in the process of design to improve the harmony between the user, the building and the environment in which it is placed. In this paper, the effectiveness of the post graduate program in the environmental design has been studied through SWOT analysis and recommendations have been made for improvement of the program.

Keywords: Open and Distance Learning, Continuing Education, Environmental Design.

RELIABILITY-BASED MODEL FOR ESTIMATING LONG TERM PAVEMENT MAINTENANCE CONTRACTS UNDER PERFORMANCE SPECIFICATIONS

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ABSTRACT

This paper presents a model through which the cost associated with pavement warranty in performance based maintenance contracts are analyzed and quantified. Performance based maintenance contracts are eventually getting popular among the Highway agencies.These are long term pavement warranty contracts where the contractors are responsible for maintaining the pavement condition upto a certain specified level over the period of warranty. The trend now is to award the maintenance contracts for a longer period of time, generally upto ten years or even more in some cases unlike the short warranty contracts. With the evolution of these new form of contracts, the challenge is to estimate the cost associated with these contracts for a specified performance period. Unlike the deterministic approach of cost estimation for new products, the maintenance contracts have probabilistic cost estimation approach. Since maintenance action is required when the performance threshold is exceeded, the time to failure of the product (when the performance threshold level is exceeded) is a random variable. This necessiates a different cost estimation approach for maintenance contracts of product (pavement) which is presented in this paper. The developed model can be used by the Highway Agencies as well as the contractors to estimate the cost of performing such long term pavement performance contracts based on stipulated performance criteria.

Keywords: Performance, Contract, Pavement, Warranty, Specification.

A FRAMEWORK TO ASSESS SUSTAINABILITY OF COMMUNITY-BASED WATER PROJECTS USING MULTI-CRITERIA ANALYSIS

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ABSTRACT

The application of Monitoring and Evaluation systems to assess water facility projects has provided decision makers to plan for the sustanability of the future projects based on the performance of the existing projects. There are many subjective and objective opinions while determing the effectiveness of these projects. For the community–based projects, sustainability is a major cause of concern to all the stakeholders. Inorder to monitor and evaluate the sustainability of these projects, different indicators are identified for measuring their effectivenes. A framework for an integrated evaluation system is developed in this study using analytical hierarchy process for multiple-criteria decision making. There is much subjective information that needs to be quantified inorder to remove any bias in evaluator's assesment of qualitative measures. A framework developed in this study in this study is then applied to assess the sustainability of the sixteen chosen water facility projects in Nepal. The results have shown that there is significant value of such framework in providing information and input for different decision-making levels.

Keywords: AHP, Sustainability, Evaluation, Monitoring, Multi-Criteria Analysis.

MALAYSIA IMPROVISED RAPID ALL-WEATHER SHELTER II (MIRAS II)

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ABSTRACT

The destruction due to earthquake in certain parts of the world had created problem of shelter to the survivors. Countries likes Indonesia, China, Japan, Iran and Pakistan which are prone to earthquake have severe weather condition. The people need immediate shelter to protect from this weather. Under these circumstances rapid shelter all weather is the best option to help the survivors. This paper presents a model of rapid shelter known as Malaysia Improvised Rapid All-Weather Shelter or MIRAS. It discusses the construction aspect of the model and proposed MIRAS kit that is easily mobile and measurement of thermal comfort. The measurements showed that the indoor environment of the shelter suitable to protect from severe outside weather. The study revealed that the reduction of the high temperature was 17.7% between outdoor and indoor heat meanwhile the reading of relative humidity is 61.2%.

Keywords: Malaysia Improvised Rapid All-Weather Shelter.

ASSESSING THE VIABILITY OF TOTAL QUALITY MANAGEMENT IMPLEMENTATION IN CONTRACTING FIRMS OF PAKISTANI CONSTRUCTION INDUSTRY

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ABSTRACT

This paper aims at analyzing the significance and willingness of contracting firms regarding implementation of Total Quality Management (TQM) to Pakistani construction industry; the problems and conclusions are weighed and assessed respectively. An in-depth analysis and statistical sorting of data were based on extensive industry surveys via questionnaires and one-to-one interviews with key contractors of the existing market. The current practices infer the average attitude of the contractors towards the importance of adopting TQM. The aspects that were targeted such as quality in the organization employee training, and organizational culture, seem to be slightly appreciable. Also partnering is known by almost everyone in the industry but they show a low response in this regard. Lacking of having a concise and exact definition of quality was also observed. The fragmented nature of the industry is a big hurdle in TQM application. Lack of education is also one of the reasons why TQM would fail. In addition, corruption, negligence and irresponsibility are also critical issues. Contractors are apprehensive in adopting TQM philosophy as they have a myopic view and are unable to realize its long term benefit. Implementing TQM requires a major organizational change that would transform the culture, process, strategic priorities and belief of an organization. Apart from commitment top management must educate its employees on the need of TQM so that it will help to reduce the amount of work for employees if they no longer need to attend the customer complaints and defect problems.

Keywords: Total Quality Management, Employee Training, Organizational Culture, Strategic Priorities, Pakistan.

COST OVERRUN FACTORS IN CONSTRUCTION INDUSTRY OF PAKISTAN

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ABSTRACT

Cost is among the major considerations throughout the project management life cycle and can be regarded as one of the most important parameters of a project and the driving force of project success. Despite its proven importance it is not uncommon to see a construction project failing to achieve its objectives within the specified cost. Cost overrun is a very frequent phenomenon and is almost associated with nearly all projects in the construction industry. This trend is more severe in developing countries where these overruns sometimes exceed 100% of the anticipated cost of the project.

In Pakistan, construction sector is an important sector although not working to its fullest potential but still of prime significance to the country. Growth in this sector is critical for growth in national income as it is among the largest sectors that generates employment within the country as well as a key driver for economic development of Pakistan. Like many other developing countries, Pakistan is also facing critical project management related issues among which cost overrun is quite prominent. There are several factors that are responsible for these cost overruns.

This paper attempts to identify the major cost overrun factors in the construction sector of Pakistan, which can serve as the way forward for future work in coping with these overruns. A thorough literature review was done and also expert opinions from developing countries were taken, through which a number of cost overrun causes were identified in global construction industry scenario. In total forty two (42) factors were short-listed to be made part of the survey questionnaire and the survey was conducted with representatives from local general contracting firms.

Results indicated that the majority of cost overrun factors (88%) lie in medium severity impact zone (with a rating between 5 to 7.5 out of 10), signifying that major attention

needs to be given to these factors as they collectively cause considerable cost overrun. It is evident from the findings that both internal and external aspects of business setting are present as the prime contributors to cost overruns. The top ten cost overrun factors found were: fluctuation in prices of raw materials, unstable cost of manufactured materials, high cost of machineries, lowest bidding procurement procedures, poor project (site) management/ poor cost control, delays between design and procurement phases, incorrect/ inappropriate methods of cost estimation, additional work, improper planning, and unsupportive government policies. An additional finding is that medium sized construction firms experience a greater percentage of cost overrun owing to their tendency to assume greater risk for the purpose of business development. Major recommendations include: stabilizing cost of materials, increasing supply of materials and machinery, more involved cost estimation processes, vigilant project planning, close observance and documentation of cost variation trends in the sector and the country, adoption of alternative procurement strategies such as design-build contracts, and best value procurement.

Keywords: Cost overrun, Macro Economic Factors, Management Factors, Business and Regulatory Environment Factors, Pakistan.

GENETIC ALGORITHM APPROACH TO OPTIMIZE RESOURCE LEVELING AND NET PRESENT WORTH (NPW)

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ABSTRACT

Total float is a by product of the CPM calculations. It represents the length of time a none-critical activity's finish date may be delayed without affecting the completion date of the entire project. Contractors think of total float as time contingency to cope with unanticipated conditions. Consuming each day of each activity's total float and consequently choosing an allowable start date for it, leads to a new schedule for a project. This paper aims to optimize two objectives simultaneously using start dates of none-critical activities as decision variables. First objective deals with resource leveling, minimizing deviation between daily resources rates. Second objective aims to maximize net present worth of benefit for contractors. A multi-objective GA is used to solve this multi-objective problem.

Keywords: Float, CPM, Multi-Objective, Genetic Algorithm

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